Teaching Receptive Language Skills:

Recommendations for Instructors

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Receptive language refers to responding appropriately to another person's spoken language. Most curricula dedicate a proportion of early intervention to developing receptive language skills. The specific terms used to refer to the receptive language programs and the recommendations for teaching such skills vary considerably across the early intervention curricula. The present paper will provide a conceptual analysis of the desired controlling variables for different receptive language programs, teaching recommendations, a brief review of the literature to substantiate the teaching recommendations, and a discussion of the potential negative effects of deviating from the recommendations.

Young children quickly learn to respond to the spoken language of other people (i.e., receptive language) as they begin to orient to their own name and familiar voices, follow simple instructions, and identify a wide range of stimuli and events in their environment (Hart & Risley, 1995; Lovaas, 1977). Hundreds of everyday interactions with caregivers readily produce receptive language skills as children learn to select pictures in a book when an adult says the name of an item or to find the right color during reading and play activities. When basic receptive language skills are not readily acquired, a child misses many important learning opportunities resulting in delays in overall development and subsequent acquisition of spoken language (Drash & Tudor, 1993; Hart & Risley, 1992; Lovaas, 1977).

Learners with developmental disabilities require a carefully engineered environment to learn how to respond effectively to the language of others (e.g., follow instructions, identify objects by name, orient when called) (Drash & Tudor, 1993; Lovaas, 1977). Thus, many of the initial programs in early intensive behavioral intervention (EIBI) curricula are designed to teach learners to respond to their name or simple directions followed by training in literally hundreds of other receptive language targets (e.g., identifying objects by name, feature, function; Lovaas, 2003; Smith, 2001; Sundberg & Partington, 1998). If the instructional procedures for teaching receptive language skills are not optimal, several problems may emerge that can slow the rate of skill acquisition in EIBI (Schilmoeller, Schilmoeller, Etzel, & LeBlanc, 1979). For example, simple errors in arranging instructional materials can inadvertently establish a side bias (e.g., select the option on the right most of the time regardless of the task) that may hinder learning and lead to problem behavior (Green, 2001). The resulting problems with stimulus control and escape-maintained problem behavior could interfere with acquisition in other skill areas as well. It is critically important to use optimal procedures for teaching receptive language skills from the very beginning of EIBI programming to ensure that effective patterns of responding are established.

Common Terms and Conceptualization

Most EIBI curricula and conceptual models refer to the overall repertoire of responding to another's spoken language as *receptive language* (Leaf & McEachin, 1999; Lovaas, 2003, Sundberg & Partington, 1998), although the term *listener behavior* is also used (Barbera, 2007; Skinner, 1957). The first receptive skills targeted during early intervention involve responding to basic instructions (e.g., "Come here" and "Clap your hands"), one's own name, and the names of common items. Later targets in the receptive language domain include following multiple-step instructions, writing letters and numbers upon request, and identifying items based on abstract features (e.g., relative size).

Table 1 displays a sampling of receptive language programs recommended by several well-recognized early intervention curricula (Barbera, 2007; Leaf & McEachin, 1999, Lovaas, 2003, Sundberg & Partington, 1998). The terms for the different programs vary somewhat across curricula, but similar targets are displayed across rows while the programs are generally arranged from basic to advanced skills in a top-bottom

Table 1. Examples of the Terms Used to Describe Receptive Language Programs in Several Early Intervention Curricula

Barbera, 2007	Leaf & McEachin, 1999	Lovaas, 2003	Sundberg & Partington, 1998
Respond to name[S]		Respond to name[S]	Respond to name[S]
Following directions[S]	Receptive instructions[S]	Instruction following[S]	Follow directions[S]
Receptive identification[C]	Receptive labels: objects[C]	Receptive ID of objects[C]	Receptive discriminations[C]
	Receptive labels: actions[C]	Receptive ID of behaviors (actions)[C]	Receptive by feature, function, and class[C]
	Receptive labels: concepts[C]	Receptive ID of abstract features[C]	

Note. S = programs targeting simple discrimination skills. C = programs targeting conditional discrimination skills.

fashion. Regardless of the specific name of the program, it is important to conceptualize the skills based on the type of discrimination required and the desired stimulus control. Receptive language programs that involve simple discriminations can be described as a 3-term contingency: (1) an auditory instruction (discriminative stimulus), (2) a particular nonvocal response (behavior), and (3) the delivery of reinforcers, usually in the form of praise and tangible items (consequence). Educational programs that teach simple discriminations include teaching a learner to respond to their name, follow basic instructions, write letters, numbers, and shapes, and to follow many other action-specific requests. Programs that involve an auditory conditional discrimination can be described as a 4-term contingency: (1) an array of comparison stimuli (discriminative stimuli and incorrect comparison stimuli) with (2) a corresponding auditory instruction that occasions the (3) selection of the appropriate picture/object from the array (behavior) that is followed by (4) a reinforcer (consequence). The important difference between the two types of discriminations is that the auditory instruction (i.e., the sample stimulus) establishes one of the comparison stimuli as the correct one (i.e., discriminative stimulus) and the others as distracters (i.e., S-deltas) at that particular moment. Each of the comparison stimuli functions as the discriminative stimulus or distracter on a given trial. Examples of programs requiring an auditory-visual conditional discrimination are identifying items based on their name, basic features (e.g., red, has a tail), comparative features (e.g., bigger, higher), classes (e.g., foods, toys), and functions (e.g., draw with, clean with). The reader may want to use Appendix A, a list of technical terms and definitions used in the paper, as a reference.

Recent literature reviews and experimental laboratory studies provide findings that should inform the instructional procedures used to teach receptive language in school and clinic settings (e.g., Green, 2001; Grow, Carr, Kodak, Jostad, & Kisamore, 2011; Gutierrez et al., 2009; Holcombe, Wolery, & Snyder, 1994; Rodgers & Iwata, 1991). The purpose of the paper is to provide five overarching best practice recommendations for receptive language instruction. Each general recommendation is accompanied by a conceptual analysis, the specific practice parameters, a review of the experimental literature, and descriptions of common problematic response patterns that may emerge from deviating from the practice recommendations.

Recommendation 1: Require an Observing Response

An observing response is emitted by a learner before or during a training trial and results in sensory contact with the discriminative stimulus. A differential observ-

ing response (DORs) is similar to an observing response except that the learner engages in a unique observing response for each discriminative stimulus. Observing and differential observing responses are used to increase the likelihood that the learner will pay attention to the relevant features of the discriminative stimulus and to avoid the development of faulty stimulus control. Instructors should require learners to engage in some type of observing response when teaching new receptive language skills. Instructors should first assess the learner's observing repertoire and then develop an appropriate observing-response procedure.

To acquire simple and conditional discrimination skills under appropriate stimulus control, the learner must observe the relevant features of the programmed antecedent stimuli. Instructors should determine if an assessment is needed to identify the variables that affect the learner's observing repertoire. For new learners or any learner with evident difficulties observing relevant features of antecedent stimuli (e.g., rarely looks at an array of stimuli unless prompted, lack of scanning), assess the observing repertoire and employ strategies that increase the learner's observation of auditory or visual stimuli. For a learner with a documented history of faulty stimulus control (i.e., some erroneous aspect of the instructional environment controls responding), instructors should assess the observing repertoire, particularly looking for the most common barriers to effective stimulus control (e.g., positional bias, overselectivity to a certain feature), and develop specific strategies to overcome them.

Assessment of Observing Responses

Instructors should consider the learner's observing repertoire to determine if an assessment of observing is necessary. Some learners readily observe the instructional materials during receptive language programming. Assessments may not be needed for learners that readily scan items when entering a room, focus on each stimulus in a visual array during tabletop instruction, scan pages in books, and repeat auditory instructions. For learners with effective observing behaviors, a comprehensive assessment may not be needed.

One potentially helpful way to assess learner responses that may interfere with the acquisition of receptive language programs, termed listener responding in this assessment, is the Verbal Behavior Milestones and Assessment Placement Program's Barriers Assessment (Sundberg, 2008). Several sections of the Barriers Assessment help instructors identify responses and/or deficits that may interfere with the acquisition of receptive language programs (e.g., limited scanning skills, difficulties observing auditory stimuli, problem behavior). Instructors might use the assessment results to select appropriate observing responses.

Develop a Strategy

The instructor should select either an observing or differential observing response depending on the learner's current observing repertoire. The purpose of the observing response is to increase the likelihood that the learner will attend to the critical and relevant features of the antecedent stimuli and avoid the development of faulty stimulus control.

For learners who readily scan materials, the instructor may select a nonspecific-observing response. For example, the instructor says "Listen," "Look at me" and requires the learner to make eye contact with the instructor. Alternatively, the instructor could teach the learner to touch a generic visual stimulus (e.g., a color card) prior to the instructor delivering the auditory instruction. Nonspecific observing responses may be useful for learners with existing observing repertoires (e.g., scans an array of stimuli, can repeat the auditory instruction). If a learner has a history of faulty stimulus control, nonspecific-observing responses may not be ideal because they are unlikely to address faulty stimulus control (Koegel, Dunlap, Richman, & Dyer, 1981). Thus, for learners with a history of faulty stimulus control, instructors should use specific strategies to ensure that learners observe the critical features of the antecedent stimuli.

The instructor may consider using a DOR to facilitate the observation of the visual array of comparison stimuli. Instructors might consider a DOR that requires the learner to match stimuli based on a critical defining feature of the subsequent receptive language skill that involves a conditional discrimination (Dube &

McIlvane, 1999; Walpole, Roscoe, & Dube, 2007). For example, if a learner is having difficulty observing the relevant visual stimuli during a program to teach receptive identification of an elephant, rhinoceros, and a zebra, the instructor could intersperse trials where the learner is required to match the critical feature(s) of the animals (e.g., the learner matches two pictures of black and white stripes before the receptive identification trial for the zebra). An instructor may consider using matching as a DOR if the learner has difficulties with observing the defining features of the relevant antecedents (i.e., responses are influenced by irrelevant features).

An instructor may consider arranging DORs for increase observing the auditory instruction. The instructor could teach the learner to emit a manual sign that corresponds to the auditory instruction or discriminative stimulus (Bonta & Water, 1981). For example, the instructor could teach the learner to sign "Sit down" after the instructor presents the auditory instruction "Sit down." Using manual signs for DORs may be particularly useful for learners with limited vocal, verbal behavior. In the same example, an instructor could require the learner to repeat the auditory instruction. For learners who have sufficient vocal imitation repertoires, the learner may benefit from naming the sample stimulus during conditional discrimination programs. Previous research on DORs requiring naming has utilized visual-visual conditional discriminations (i.e., matching-to-sample; Constantine & Sidman, 1975; Gutowski & Stromer, 2003). The experimenter required the learner to vocally name the sample stimulus (i.e., the name of the item) while simultaneously matching the pairs of visual stimuli. Although the body of research is limited to matching, matching is conceptually similar to receptive labeling programs that require auditory-visual conditional discriminations. The primary difference is that the sample stimulus in a visual-visual matching-to-sample program is visual, whereas, the sample stimulus in a receptive labeling program is auditory. Thus, the research investigating DORs to remediate stimulus control during matching-to-sample may be applicable to receptive language programs requiring conditional discriminations. Instructors may find it helpful to teach the learner to repeat the auditory instruction as a part of conditional discrimination programs. For example, the instructor could present an array of visual stimuli (e.g., pictures of a chair, lamp, and rug), say, "Lamp," and prompt the learner to repeat "Lamp" before providing an opportunity to select the correct stimulus from the array.

Recommendation 2: Minimize Inadvertent Instructor Cues

Instructors engage in programmed behaviors that are designed to teach their learners new skills. For example, the trials may be conducted at a specific pace, preselected prompting strategies may be employed (see section below), and preferred consequences are likely to be presented. However, other aspects of the instructor's behavior can inadvertently exert control over the learner's responding during listener training leading to problems with skill acquisition. For example, when teaching the receptive instructions "Stand up" and "Sit down," the content of the instructor's statement should occasion two different motor responses. However, an instructor might inadvertently speak with a lilt at the end of one spoken instruction (e.g., "Stand up") and a drop at the end of the other (e.g., "Sit down") and the change in tone might become the only feature of the stimuli that control responding (i.e., overselective responding). The term *stimulus overselectivity* refers to responding that is influenced by a single feature of a stimulus (e.g., redness) to the exclusion of other relevant features (e.g., size, texture; Lovaas, Koegel, & Schreibman, 1979; Lovaas & Schreibman, 1971; Ploog, 2010). If this happens, a learner might perform well on the instructions with one instructor and poorly with other instructors who say the same words without the tonal changes that control responding (i.e., false mastery). Although there are different variables that account for it, false mastery occurs when a learner's accurate responses are influenced by unintended antecedent stimuli (e.g., tone of voice) rather than the programmed stimuli. Essentially, the instructor's behaviors become features of the instructional event that signal the availability of reinforcement for a specific response (i.e., a discriminative stimulus) regardless of the other aspects of the stimuli that are presented. Instructors should minimize the likelihood of faulty

stimulus control by eliminating the most common inadvertent cues for responding as overselective responding occurs for a modest proportion of individuals with developmental disabilities (Dickson, Wang, Lombard, & Dube, 2006).

Eye Gaze and Physical Movements

An analysis of the instructor's task reveals several reasons why inadvertent cues might be shaped in the course of teaching. For example, the instructor is responsible for responding quickly to accurate learner responses by providing reinforcers and may be responsible for quickly blocking errors or implementing error correction. Looking at the correct stimulus in an array might decrease the instructor's response time and accuracy of detection of a correct response or error; however, it could also establish faulty stimulus control. Instructors should look directly at the learner's face during the presentation of the trial and avoid any gaze shifts. Instructors should be explicitly trained to criterion to have consistent and accurate eye gaze; however, since people are unlikely to detect subtle patterns evolving in their own behavior, instructors should monitor procedural integrity for common gaze patterns that could inadvertently establish faulty stimulus control. Instructors should monitor implementation to detect inadvertently looking toward the location for a desired response for receptive instructional programs (e.g., glance at the bookshelf when saying "Get the book," glance at the wall when saying "Turn on the light," glance down while saying "Touch your feet") or the target stimulus in a visual array for conditional discriminations. When presenting arrays for selection responses, the instructor should make eye contact throughout presentation of the stimuli and monitor for hand movements. When the learner's hand moves, instructors should orient their gaze to the learner's hand rather than to the visual array.

Common physical movement patterns can also inadvertently establish faulty stimulus control. Consistently placing a hand nearer to an incorrect stimulus might be shaped over trials because the instructor is able to block error responses quickly; however, it could also lead to the learner selecting the stimulus farthest away from the instructor's hand. Instructors should monitor implementation to detect movements toward an object or location (e.g., pointing or a head nod toward the toy bin when saying "Get the toy"), small movements that mimic or are a component of the target response for receptive instruction (e.g., moving hands up slightly while saying "Raise your arms") or consistent placement of the hands nearer to correct or incorrect stimuli. Instructors should minimize all changes in posture and body position while presenting trials and to always place the hands in the same position after stimulus presentation (e.g., flat on the table within reach of all stimuli, clasped in lap during receptive instructions). When array-based trials are conducted, instructors might also inadvertently set down the correct stimulus first or last regardless of position in the array. If the correct stimulus is consistently placed on the table first or last, the learner can consistently contact reinforcement for responding based only on the instructor's behavior rather than the stimulus features. To prevent this potential problem, instructors should arrange the stimulus materials out of the sight line (Green, 2001) of the learner for 3-D stimuli and use preprepared stimulus arrays for 2-D stimuli (e.g., preprinted sheets in a binder, Velcro board, or electronic stimulus presentation on a computer).

Voice Modulation

The typical goal in establishing effective auditory discriminative stimuli is to have the content control responding (e.g., "Red" evokes selecting red, "Get in line" evokes standing in line with peers). The content of the auditory instruction is only one of many potentially salient characteristics of an auditory instruction; pitch, rhythm, and volume are also stimulus features. If an erroneous stimulus feature (e.g., pitch) consistently covaries with the content of the auditory instruction, the irrelevant feature might inadvertently evoke responding in the training context (e.g., the one with the lilt at the end standing up). If this pattern is established, the learner may master the target responses during training but fail to emit them during maintenance probes when multiple targets are tested that include the lilt or when another instructor presents the same auditory instruction without the unusual stimulus feature. To avoid establishing faulty stimulus control for auditory stimuli,

instructors should use a consistent pitch for all stimuli and avoid exaggerating or elongating the pronunciation of parts of the auditory instruction without a specific plan in place for fading the stimulus features (i.e., within-stimulus fading procedures).

Recommendation 3: Arrange the Antecedent Stimuli and Required Behaviors

The arrangement of the antecedent stimuli during receptive language training directly influences the type of discrimination taught and the likelihood of establishing the desired stimulus control. The first two recommendations target the learner's observing and the instructor's inadvertent cues. The third recommendation emphasizes the instructor's selection of the antecedent stimuli and required responses. Five critical steps for programming the teaching arrangement are described below with guidelines for each: (a) plan the required behaviors, (b) introduce new targets (stimuli or responses) simultaneously, (c) select the auditory stimuli, (d) counterbalance the auditory and/or visual stimuli, and (e) select the specific features of the discriminative stimulus and the incorrect visual comparison stimuli.

Plan the Required Behaviors

Instructors should consider the types of behaviors that are taught during simple discrimination programs. The current behavioral repertoire of the learner and the applied goals of the program should ultimately guide the selection of responses. Within those parameters, the behaviors targeted at any given time (i.e., as a training set) should be as distinctly different from each other as possible, particularly for the initial targets. For example, a program to teach receptive identification of body parts might include a training set consisting of feet, knees, and head. A less ideal training set of early targets may include stomach, thigh, and chest because of the proximity of the targets in relation to each other and the similarity of the body movements to touch those parts. If the targets are not distinct enough from the learner's perspective, the learner might begin to emit each of the targeted behaviors in rapid succession, repeat the response targeted in the prior trial or emit responses that are difficult for the instructor to distinguish (e.g., the learner touches both stomach and thigh simultaneously with the same hand). Later sets of targets might purposefully include responses that share some similarities so that the learner begins to make increasingly more challenging simple discriminations. In fact, it may be important to teach subtle, yet functional differences among stimuli and responses (e.g., drawing a pentagon, hexagon, and octagon; identifying someone's fingernail, knuckle, and fingertip) once several basic responses have already been mastered.

Similarly, instructors should avoid teaching in a way that pairs positional status of the body with the targeted response. For example, an instructor may generate two sets of targeted responses and teach one set of responses while the learner is standing (e.g., "Jump," "Walk," and "Bend over") and the other set of responses while the learner is in a seated position (e.g., "Touch head," "Clap hands," and "Stomp feet"). With this arrangement, it is possible that the positional status of the body may come to control responding rather than the auditory discriminative stimulus (i.e., faulty stimulus control). To date, the authors are unaware of studies that have specifically examined the role of the discriminability between the required behaviors during receptive language programs involving simple discriminations.

Introduce Multiple Targets Simultaneously

Instructors should introduce the training stimuli in a simultaneous fashion by presenting and targeting multiple stimuli across trials in a session. For example, in a conditional discrimination program, an instructor may teach "Coat," "Shoes," and "Pants" by presenting all three pictures of the items on each trial and rotating the discriminative stimulus across trials. Similarly, in a simple discrimination program for following one-step instructions, the instructor should present different instructions (e.g., "Stand up," "Touch your nose," "Clap your hands") across trials within the same teaching session.

In clinical practice, instructors may have implemented or observed programs in which new receptive language targets are introduced sequentially in a massed-trial format. Recommendations for teaching simple

discriminations in a massed-trial format as an initial component of conditional discrimination training are common (Leaf & McEachin, 1999; Lovaas, 2003; Maurice, Green, & Luce, 1996). Lovaas (2003) provided a detailed description of how to use a sequential method for teaching receptive language programs. If a sequential method is used, a 3-array receptive identification program is taught in a series of nine steps that include (a) teaching each stimulus in isolation, (b) teaching each stimulus as a simple discrimination in the presence of an incorrect comparison stimulus (i.e., always the same target but a nontarget stimulus is also present), and (c) teaching the stimuli as conditional discriminations (i.e., the correct stimulus varies according to the instructor's auditory instructions).

To date, several studies have evaluated the acquisition, maintenance, and/or generalization of conditional discrimination programs when comparing sequential and simultaneous methods (Grow et al., 2011; Grow, Kodak, & Carr, in press; Johnston, Buchanan, & Davenport, 2009; Waldo, Guess, & Flanagan, 1982) or two different sequential methods (Gutierrez et al., 2009) for introducing new targets. Although the specific methodologies of the studies vary, several themes emerge when examining the results. First, teaching in isolation (i.e., a simple discrimination) is unlikely to increase the efficiency of acquisition of subsequent conditional discriminations (Grow et al., 2011; Grow et al., in press; Gutierrez et al., 2009). Second, the simultaneous method may produce better maintenance of skills over time (Grow et al., 2011). Third, generalization of receptive language skills is better after an instructional history with a simultaneous method (Waldo et al.). Although there are few published studies directly comparing approaches for teaching receptive language skills, the existing body of research in both basic and applied studies is fairly consistent in its support for simultaneously introducing stimuli from the outset of instruction (e.g., even for very early learners who are first encountering the teaching preparation). This paper is focused on receptive language skills; however, previous studies have compared the simultaneous and sequential introduction of new skills such as tracing (Panyan & Hall, 1978), imitation (Schroeder & Baer, 1972), and tact training (Cuvo et al., 1980; Doyle, Wolery, Ault, Gast, & Wiley, 1989). Overall, the simultaneous method is better in terms of acquisition, maintenance, and/or generalization of skills. Thus, recommendations for teaching simultaneously can be applied to many early intervention programs.

A good rule of thumb is to include at least three new targets at the start of training to reduce the likelihood of reinforcing correct responses occurring under faulty stimulus control (e.g., position biases). Smaller array sizes during conditional discrimination programs can yield errors because the reinforcement schedule for "correct" responses occurring under faulty stimulus control is relatively dense. For example, if a learner always selects the right-side stimulus (i.e., side bias) during a two-stimulus array conditional discrimination program, the probability of reinforcement for error responses is 50% (i.e., variable-ratio 2 schedule). In contrast, the probability of reinforcement for selecting the rightmost stimulus drops to 25% in a four-stimulus array. Another problem with using an array of two stimuli is that it is difficult to determine if the learner has acquired a selection or rejection relation (Johnson & Sidman, 1993). For example, if a learner masters a receptive color identification program with the colors red and blue, it is difficult to determine if the learner is responding away from the blue visual stimulus or selecting the red stimulus when the instructor presents the auditory sample, "Red." If a learner is responding away from the blue stimulus, the instructor will not likely detect the problem until the learner is required to select a red stimulus in the absence of a blue stimulus. Due to the multiple issues with teaching in isolation, instructors should include multiple stimuli in the visual array. Few studies have evaluated the impact of array size on conditional discrimination learning in applied settings and additional research is needed.

In addition to teaching multiple new receptive language skills simultaneously, instructors should consider interspersing mastered targets that are related or unrelated to the receptive language targets. The instructor should consider the magnitude (i.e., high versus low quality) and schedule of reinforcement (i.e., continuous or intermittent schedule) for the mastered targets

(Charlop, Kurtz, & Milstein, 1992; Volkert, Lerman, Tosclair, Addison, & Kodak, 2008) during program planning.

Select Appropriate Auditory Instructions

The auditory instructions during receptive language programs should only contain the relevant information (Green, 2001; Tarbox, Tarbox, & O'Hora, 2009). Including unnecessary information in the auditory instruction introduces the risk of irrelevant features exerting stimulus control over responses. A brief instruction such as "Red" is better than "Point to red" or "Show me the red one" because the similarity of the auditory stimuli across targets is minimized. When instructions such as "Show me red," "Show me blue," and "Show me green," the auditory stimuli are nearly identical, which could impair the ability of the single critically different feature to occasion correct responses. Rather, the stimulus "Show me" may gain control over responses, which may be evidenced by the learner attempting to respond prior to the instructor completing the presentation of the auditory instruction. Thus, the instructor should select concise auditory instructions to maximize the salience of the critical component of the auditory instruction and minimize the similarity of the auditory stimuli across trials. Although instructors should use clear and concise instructions, lengthier auditory instructions may be used if the goal of the discrimination program is to teach a learner how to respond to more complex instructions (e.g., engage in different kinds of selection responses after hearing different instructions such as "Cover," "Touch," and "Hide").

Counterbalance the Visual and/or Auditory Stimuli

The instructor should rotate the auditory and/or visual stimuli across trials in a balanced manner. For simple discrimination programs, the auditory instructions should be presented semirandomly and proportionally within the same teaching session (e.g., rotate between three instructions, three times during a nine-trial session). For conditional discrimination programs, the instructor should present the auditory stimuli as described above and also rotate the correct and incorrect visual stimuli across the comparison positions in a counterbalanced fashion (see Figures 1 and 2 for several examples of counterbalanced rotations). Instructors can use counterbalancing regardless of precisely how stimuli are presented to the learner (e.g., horizontal, vertical, scattered). When presented horizontally, visual comparisons should be presented and targeted proportionally in the left, middle, and right positions. Similarly, if the visual stimuli are presented in a vertical fashion, the items in the array should be targeted evenly across the top, middle, and bottom positions.

Although unintentional, if the stimuli are not presented in a balanced format, the instructor may present the targets in a way that generates faulty stimulus control and leads to persistent errors (Green, 2001). For example, a side bias may be established if the instructor places the correct stimulus in a particular position more often than other positions because the proportion of available reinforcers is higher for that position. Similarly, a learner may learn to respond away from a comparison position if the correct stimulus is rarely put in that particular position in the array. The instructor is likely to overlook imbalances or idiosyncratic patterns in their stimulus presentation during sessions. Thus, a strategy for accurately counterbalancing the auditory and/or visual stimuli should be used because even subtle deviations from counterbalancing can come to negatively affect acquisition and errors over time.

A well-designed data collection sheet can assist instructors with following the counterbalancing recommendations presented above. Figure 1 displays an example of a data sheet for a receptive language program involving auditory-visual conditional discriminations. For each trial, the stimuli included in the array are presented from the learner's perspective and the bolded stimulus indicates the target (i.e., discriminative stimulus). The presentation of the stimuli is counterbalanced according to the recommendations from Green (2001) such that all stimuli are targeted proportionally across trials in a session. The data sheet includes three different session types to counterbalance the presentation of the stimuli across sessions. Instructors should record the learner's first selection response regardless of accuracy to evaluate faulty stimulus control, if necessary. To evaluate skill acquisition over time, the instructor

Figure 1. The example data collection sheet illustrates how to properly counterbalance three visual comparison stimuli in an array and the rotation of the discriminative stimulus (i.e., the bolded stimulus) during a receptive identification of actions program.

#____

Trial	Session Type A			Ind	Prompt
1	Coloring	**Bathing**	Dancing		
2	Bathing	Dancing	**Coloring**		
3	**Dancing**	Coloring	Bathing		
4	**Coloring**	Bathing	Dancing		
5	Bathing	**Dancing**	Coloring		
6	Dancing	Coloring	**Bathing**		
7	Coloring	Bathing	**Dancing**		
8	**Bathing**	Dancing	Coloring		
9	Dancing	**Coloring**	Bathing		

#____

Trial	Session Type B			Ind	Prompt
1	Bathing	Dancing	**Coloring**		
2	**Dancing**	Coloring	Bathing		
3	Coloring	**Bathing**	Dancing		
4	Bathing	**Dancing**	Coloring		
5	Dancing	Coloring	**Bathing**		
6	**Coloring**	Bathing	Dancing		
7	**Bathing**	Dancing	Coloring		
8	Dancing	**Coloring**	Bathing		
9	Coloring	Bathing	**Dancing**		

#____

Trial	Session Type C			Ind	Prompt
1	**Dancing**	Coloring	Bathing		
2	Coloring	**Bathing**	Dancing		
3	Bathing	Dancing	**Coloring**		
4	Dancing	Coloring	**Bathing**		
5	**Coloring**	Bathing	Dancing		
6	Bathing	**Dancing**	Coloring		
7	Dancing	**Coloring**	Bathing		
8	Coloring	Bathing	**Dancing**		
9	**Bathing**	Dancing	Coloring		

Figure 2. The example data collection sheet illustrates how to properly counterbalance the auditory discriminative stimuli during a receptive instructions program.

#____

Trial	Session Type A	Ind	Prompt
1	Clap hands		
2	Stomp feet		
3	Touch toes		
4	Stomp feet		
5	Clap hand		
6	Touch toes		
7	Touch toes		
8	Stomp feet		
9	Clap hands		

#____

Trial	Session Type B	Ind	Prompt
1	Stomp feet		
2	Touch toes		
3	Clap hands		
4	Clap hands		
5	Stomp feet		
6	Touch toes		
7	Stomp feet		
8	Clap hands		
9	Touch toes		

#____

Trial	Session Type C	Ind	Prompt
1	Touch toes		
2	Clap hands		
3	Stomp feet		
4	Clap hands		
5	Touch toes		
6	Stomp feet		
7	Stomp feet		
8	Touch toes		
9	Clap hands		

should also indicate whether the correct response was prompted or independent by checking the appropriate column. Figure 2 displays a data collection sheet for a receptive instructions program. The required behaviors on the part of the learner are counterbalanced within and across sessions similarly to the data collection sheet presented in Figure 1.

Select the Features of the Discriminative Stimulus and Incorrect Comparison Stimuli

The instructor should arrange the features of the discriminative stimulus and incorrect comparison stimuli displayed within the comparison stimuli. The features of a particular discriminative stimulus (e.g.,

round, green) should be salient. In addition, the relevant feature(s) of a given discriminative stimulus should be absent from the incorrect comparison stimuli. For example, if the learner is taught to select items based on their roundness, the instructor should ensure that all incorrect comparisons do not contain round elements. The introduction of any feature of the discriminative stimulus to the incorrect comparison stimuli may inadvertently establish faulty stimulus control. For example, an instructor may use a set of stuffed animals to teach color identification. The stuffed animals are identical in shape, vary in color (e.g., black, pink, yellow) but all have black eyes and a mouth. Although seemingly unimportant, the feature "black" is contained in all of the stuffed animals and complicates the learner's task of identifying items based on color.

The instructor should ensure that the features of the incorrect comparison stimuli differ from the discriminative stimulus along the critically defining features (Allen & Fuqua, 1985). If the incorrect comparison stimuli differ along more than one dimension, one of which is not a defining characteristic of the discriminative stimulus, a learner's selection responses may come under the control of irrelevant stimulus features. For complex discriminative stimuli that contain multiple defining features, it may not be possible for instructors to select incorrect comparison stimuli that vary along every critical feature. However, including a range of incorrect comparison stimuli that differ along the most relevant dimensions will likely contribute to the development of appropriate stimulus control (Allen & Fuqua). For example, if the instructor is teaching an individual to receptively identify lotion, it may be important to include other bath products as incorrect comparison stimuli because the discrimination in the natural environment will include subtle discriminations among items such as lotion, body wash, and shampoo (e.g., opacity of the liquid inside the bottles). Although these stimuli are similar in terms of features (e.g., bottle shape and size, bottle top) and context of use, the functions of the items are different and should be directly taught to the learner. Applied research on this topic is limited but basic animal research also suggests that the discriminability (i.e., salience of the defining characteristics) among comparison stimuli as well as the auditory sample stimuli affect the speed with which conditional discriminations are acquired (Carter & Eckerman, 1975).

Recommendation 4: Prompting and Differential Reinforcement

The goal of the fourth recommendation is to promote rapid acquisition by minimizing or eliminating persistent errors and increasing consistent use of effective reinforcers. To accomplish this, instructors should (a) identify an effective prompt(s) and prompt fading strategy, (b) conduct regularly scheduled systematic preference assessments to identify several potential reinforcing stimuli, and (c) provide differential reinforcement for independent, correct responses. General guidelines and considerations for each recommendation are presented with reference to several published literature reviews on topics beyond the scope of the paper (e.g., an overview of prompt fading strategies).

Identify an Effective Prompt(s) and Fading Strategy

Prompts are used temporarily to evoke correct responses during initial teaching sessions for a new skill (MacDuff, Krantz, & McClannahan, 2001). An instructor can choose from two broad categories of prompts: stimulus prompts and response prompts. Stimulus prompts are modifications to instructional materials to occasion a correct response. Examples include increasing the physical size of the correct target and emphasizing an aspect of the discriminative stimulus (Green, 2001). Extra-stimulus prompts involve the addition of stimuli to the discriminative stimulus to facilitate a correct response (Schreibman, 1975). For example, an instructor can place yellow highlighting around the correct comparison stimulus and fade the highlighting over time. Within-stimulus prompts alter aspects of the discriminative stimulus to increase the saliency of its defining features (Rincover, 1978). For example, during a receptive identification of animals program, an instructor can present an elephant trunk in isolation (i.e., a defining feature of an elephant) during initial training and slowly add in components of the discriminative stimulus (e.g., the ears, body, and

tail) over time. Response prompts involve instructor behavior that occasions correct responses (e.g., pointing to the correct visual stimulus, modeling the correct behavior, providing minimal physical guidance; see MacDuff et al., 2001 for a review). While prompts are useful teaching tools, it is critical to fade prompts in a systematic and timely manner to avoid prompt dependence (Wolery & Gast, 1984). The type(s) of prompt chosen by the instructor will guide the selection of the appropriate prompt fading strategy. Regardless of the strategies used, prompt fading should result in the rapid acquisition of independent skills with minimal errors. Instructors should select prompts and fading strategies that are likely to be effective based on the learner's behavioral repertoire and barriers (e.g., touch is aversive) and are practical with respect to the resources required for prompt fading.

Assessments of prerequisite repertoires allow the instructor to capitalize on the learner's skill strengths and minimize possible barriers to acquisition when selecting prompting strategies. For example, instructors might select model prompts (Lovaas, Freitas, Nelson, & Whalen, 1967) for learners with generalized imitation repertoires. If a learner has strong matching-to-sample skills, a modified identity-matching prompt could be used during receptive language programs involving conditional discriminations (e.g., the instructor presents the auditory sample stimulus while the learner engages in the matching task). Similarly, an identity-matching prompt might be appropriate for learners who have difficulties observing the critical features of the comparison stimuli (Carp, Peterson, Arkel, Petursdottir, & Ingvarrson, in press; Fisher, Kodak, & Moore, 2007). For learners who observe irrelevant features of stimuli, display overselective responding, or have a history of faulty stimulus control, extra-stimulus prompts should be avoided. Extra-stimulus prompts (e.g., positioning one stimulus in the array closer than the others) may hinder the establishment of appropriate stimulus control during discrimination training (Koegel & Rincover, 1976) because responses are brought under faulty stimulus control during initial teaching. Instructors should also consider whether the presentation of particular types of prompts (e.g., physical guidance) is likely to evoke undesirable behavior (e.g., moving away from the instructor, negative vocalizations) or be overly intrusive. If a learner has strong matching and imitation skills, physical prompts should be avoided despite their inherent effectiveness, as they are unnecessarily intrusive.

Finally, instructors should consider the practical aspects of fading for each possible type of prompting strategy under consideration for a given learner. For example, if a within-stimulus prompt is selected, a stimulus fading strategy should be used where the instructor gradually alters the prompt along the salient features of the discriminative stimulus. If within-stimulus prompts are used, the materials should be generated in a manner that allows the instructor to fade the prompt along the relevant aspects of the discriminative stimulus (Rincover, 1978; Schreibman & Charlop, 1981). However, the instructor should also consider whether the materials and staff time needed to generate the stimuli for fading are available. If staff resources are limited, response prompts should be explored either in a progressive hierarchy (e.g., most-to-least prompting) or in a single prompt form with a temporal fading strategy (e.g., constant or progressive time-delay). A review of the types of prompts and appropriate prompt fading strategies is beyond the scope of this paper. However, several published literature reviews provide an overview of prompt fading procedures with clinical recommendations for their use (e.g., Demchak, 1990; MacDuff et al., 2001; Mueller, Palkovic, & Maynard, 2007; Waugh, Alberto, & Fredrick, 2011; Wolery & Gast, 1984).

Overall, prompt fading should result in the rapid acquisition of skills and minimal errors. If there are persistent errors or stalled progress in learning, instructors may consider using a different prompt fading strategy and/or evaluating other contextual variables that may affect learning (e.g., the manner in which stimuli are presented, the reinforcement system). Previous research indicates that exposure to ineffective prompt fading procedures can impede learning despite the introduction of effective fading strategies (Schilmoeller et al., 1979). Therefore, instructors should identify effective prompts and a prompt fading strategy during program planning to maximize learning outcomes.

Conduct Systematic Preference Assessments

The purpose of a preference assessment is to identify a hierarchy of preferred stimuli to determine items and/or activities that are likely to function as reinforcers (Hagopian, Long, & Rush, 2004). Researchers have developed a wide range of techniques for assessing the preferences of individuals with developmental disabilities (see Cannella, O'Reilly, & Lancioni, 2005; Hagopian et al., 2004; Tullis et al., 2011 for a description). Common methods include the paired-choice (Fisher et al., 1992), multiple stimulus (without replacement) assessment (MSWO; DeLeon & Iwata, 1996), and free-operant method (Roane, Vollmer, Ringdahl, & Marcus, 1998). Instructors should select an appropriate preference assessment based on the learner's repertoire including the ability to scan a visual array, tolerate the removal of preferred items, and choose among an array of stimuli. For example, an MSWO may be inappropriate for learners with difficulty scanning a large visual array. The authors recommend that instructors see Karsten, Carr, and Lepper (2011) for an example of a clinical model used to select and implement systematic preference assessments based on individual learner factors.

Use Differential Reinforcement

Instructors should use differential reinforcement to promote independent, correct responses during receptive language programs. Within the context of skill acquisition, differential reinforcement is arranged by providing higher magnitude reinforcers or denser schedules of reinforcement for independent responses than prompted responses (for a review of the literature, see Vladescu & Kodak, 2010). The magnitude of reinforcement can be manipulated in terms of duration (e.g., brief versus extended access to a toy), amount (e.g., one versus several small pieces of a snack), and intensity (e.g., access to low versus moderate volume music). Schedules of reinforcement can be manipulated in several ways. Typically, continuous schedules of reinforcement (i.e., every response is reinforced) are used for independent responses while prompted responses result in intermittent reinforcement (e.g., every two or three responses are reinforced) or extinction (i.e., no prompted responses are reinforced).

While it may be necessary to provide high-quality reinforcers for prompted responses during the first few teaching sessions, instructors should reserve the best quality reinforcers for independent correct responses. A small, but growing body of research suggests that more rapid transfer of stimulus control occurs when independent correct responses are differentially reinforced (Karsten & Carr, 2009; Olenick & Pear, 1980; Touchette & Howard, 1984). To date, no studies have compared different methods of differential reinforcement (e.g., magnitude versus schedule manipulations) for transferring stimulus control from prompts to discriminative stimuli.

Recommendation 5: Troubleshoot Existing Problems With Stimulus Control

Despite our best efforts to program optimal stimulus control, problems may develop. The following performance patterns might be indicative of problems with stimulus control. Faulty stimulus control may be implicated if the learner makes a selection prior to the presentation of the auditory instruction. The learner may also shift between responses that are currently targeted and/or those that have been previously targeted (e.g., following "Touch nose," the learner touches their stomach and nose in rapid succession). Following an auditory instruction, the learner may look at the instructor and wait to respond. This pattern would suggest that the learner is observing other unintentional aspects of the instructor behavior (e.g., movements, looking at the target stimulus) rather than the intended auditory instruction. During receptive language programs involving conditional discriminations, faulty stimulus control is likely if the learner selects visual stimuli based on the placement in the array (i.e., side bias). The learner may engage in a large proportion of errors or inconsistent performance (i.e., sometimes accurate, sometimes below chance). Similarly, a learner may meet the mastery criterion but perform poorly during maintenance and generalization probes. Escape-maintained problem behavior may occur as a result of inconsistent or lean schedules of reinforcement associated with high error rates.

Table 2. Examples of Issues That Might Arise During Receptive Language Instruction and Some Potential Solutions

Issue	Potential solution
Learner displays a side bias during receptive langauge programs	Increase the array size
Learner responses are influenced by the instructor's behavior	Identify and eliminate the instructor behavior (e.g., looking at the correct visual comparison stimulus)
Learner engages in switching responses when two targets are similar	Separate targets into two training sets and ensure that the new training sets contain distinction targets
Learner responds prior to the delivery of the antecedent stimuli	Prevent or block responding prior to the delivery of the relevant antecedents; require a differential observing response; place premature responses on extinction

If these performance patterns develop, instructors should conduct an analysis of the potential source(s) of stimulus control that might have been established based on the program components (e.g., prompting strategies, arrangement of stimuli) and develop strategies to remediate the faulty stimulus control (see Table 2). For example, an instructor may suspect that inadvertent small movements are evoking correct responses during a receptive instructions program resulting in false mastery. To test whether this faulty stimulus control is a problem, a different instructor could conduct the teaching session and accuracy across instructors could be compared. Alternatively, if the instructor has been arranging the visual stimuli in front of the learner and suspects that some placement cue could be occasioning correct selection responses, the instructor could switch to preparing the stimuli out of sight of the learner. If the learner is tracking the correct stimulus by observing the instructor prepare the stimuli, changes should occur in the accuracy of responding.

If there are specific targets that have already been inadvertently trained under faulty sources of stimulus control, the instructor should decide whether the specific targets are worthy of targeting again as the effort required to eliminate faulty stimulus control and program new control may be substantial (Schilmoeller et al., 1979). If those particular targets were arbitrary (e.g., "Touch your feet," "Find the hippopotamus"), the instructor might simply alter the programming to teach new targets optimally. If the targets were critical for long-term functioning (e.g., "Stop," recognizing their own name), the stimulus control must be systematically reprogrammed by reintroducing the stimuli under optimal programming conditions, using errorless learning procedures and eliminating the erroneous stimulus features that are currently controlling responding. For example, an instructor selects two similar targets in terms of the antecedent stimulus (e.g., "Stand up," "Stomp feet"), and the learner develops faulty stimulus control. During trials, the learner is responding before the instructor presents the entire auditory instruction and engages in "switching" responses (i.e., rapidly alternating between stomping feet and standing up and down). The instructor could pick one of the targets and include it in a new training set with other stimuli that have dissimilar auditory instructions. A progressive prompt delay could be used to promote accurate responding during trials. If the learner engages in vocal verbal behavior, the instructor might consider prompting the learner to engage in echoic behavior following the auditory instruction to increase the saliency of the auditory instruction and promote observing.

Conclusion

Receptive language skills are ubiquitous in everyday situations. Thus, receptive language is a critical skill and included in every version of curriculum for EIBI regardless of the specific terms that are used. An understanding of the conceptual analysis of the receptive language skills will enhance programming by ensuring that the instructional variables are properly presented to the learner. First, instructors should understand that the most common receptive targets fall in two important and distinct categories—simple and conditional discriminations. Second, all skill acquisition is predicated upon the principle of stimulus control and certain well-established best practices will allow instructors to optimize stimulus control. Third, that same conceptual analysis can guide troubleshooting and resolution when problems do develop.

The current paper outlines five overarching best practices that should guide programming in receptive language skills. First, the instructor should require the learner to attend (i.e., observing response) prior to presenting the antecedent stimulus. Second, the task should be presented in a way that eliminates or substantially reduces the risk of the instructor providing inadvertent cues. Third, the instructor should arrange the antecedent stimuli to increase the likelihood that appropriate stimulus control will be established. Fourth, the instructors should select an effective prompt fading and use differential reinforcement to transfer stimulus control from prompts to the relevant antecedent stimuli. Fifth, if faulty stimulus control is suspected, the instructor should troubleshoot the existing problems with stimulus control to determine if a strategy should be implemented to remediate the faulty control.

It is important to provide instruction in a way that helps learners establish effective learning repertoires. Receptive language programming is often targeted to teach learners to pay attention to the instructions of other people. If a learner establishes "shortcuts" or repertoires based on faulty stimulus control, the learner's progress in other areas may be undermined. In addition, receptive language programs are common programs for early learners or learners who are progressing on to pre-academic areas. Thus, it is critically important that appropriate stimulus control is established to maximize the learner's progress during skill acquisition programs that rely on an already established receptive language repertoire.

Although there is solid empirical support for EIBI, there are areas in which no direct experimental evidence exists to inform how we teach particular skills (Eldevik et al., 2009; Howlin, Magiati, & Charman, 2009). However, there is substantial experimental and applied literature that is pertinent to receptive language to guide the development of best practice guidelines. This paper was designed to integrate the literature while providing useful and practical resources for instructors.

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Appendix A

Auditory-visual conditional discrimination: a type of conditional discrimination involving a 4-term contingency: (1) the presentation of an auditory sample stimulus, (2) the presentation of an array of visual comparison stimuli, (3) a selection response, (4) the delivery of a reinforcer.

Comparison stimuli: the visual array of stimuli presented during auditory-visual and visual-visual conditional discrimination training. The function of the comparison stimuli (i.e., a discriminative stimulus or S-delta) is altered by the presentation of the auditory or visual sample stimulus.

Counterbalancing: a method of arranging the antecedent stimuli such that each of the stimuli are presented proportionally across sessions. The presentation of the auditory instruction should be counterbalanced across sessions in which simple discriminations are taught. The presentation of the auditory instruction and the comparison array should be counterbalanced for auditory-visual conditional discrimination training.

Differential reinforcement of independent correct responses: providing reinforcers for independent correct responses while providing lower quality reinforcers for prompted responses or placing prompted responses on extinction.

Differential observing response: the learner engages in a unique observing response for each sample stimulus.

Discriminative stimulus: for a receptive language program requiring simple discriminations, the auditory instruction presented by the instructor functions as the discriminative stimulus. For receptive language programs requiring conditional discriminations, the correct comparison stimulus on a given trial functions as the discriminative stimulus.

Distracter stimulus: a stimulus in the array of comparison stimuli that functions as the incorrect response (i.e., S-delta) during a given trial.

Faulty stimulus control: learner responses that are evoked by irrelevant or a restricted range of antecedent stimuli.

Generalized imitation repertoire: the learner can reliably engage in imitation behavior when presented with novel, untrained imitation tasks.

Interspersal: embedding mastered tasks into a teaching session with new acquisition tasks.

Mass trials: the instructor teaches one relation in isolation within a teaching session.

Observing response: a learner response that results in sensory contact with the sample stimulus.

Response prompts: the instructor supplements the behavior of a learner by proving gestural, model, or physical prompts to increase the likelihood of a correct response.

Sample stimulus: the first part of the contingency for conditional discrimination training. The sample stimulus alters the function of the comparison stimuli.

Sequential method: teaching a set of relations as simple discriminations before targeting the relations as conditional discriminations.

Simple discrimination: a type of discrimination involving a 3-part contingency: (1) the presentation of a discriminative stimulus, (2) a learner response, and (3) the delivery of a reinforcer.

Simultaneous method: teaching a set of relations as a conditional discrimination from the onset of training (e.g., teaching a child to identify "green," "yellow," and "purple" from an array after hearing the name of each color within the same session).

Stimulus control: the presence or absence of antecedent stimuli influences the emission of behavior.

Stimulus overselectivity: a type of faulty stimulus control in which responses are evoked by only a subset of features in a multi-component antecedent stimulus.

Stimulus prompts: a modification or addition to the discriminative stimulus thatevokes correct responses.

Visual matching-to-sample: a type of conditional discrimination involving a 4-term contingency: (1) the presentation of a visual sample stimulus, (2) the presentation of an array of visual comparison stimuli, (3) a selection response, and (4) the delivery of a reinforcer.